

What is claimed is:

1. Apparatus comprising:
  - a direct current power supply;
  - a direct current motor having an input terminal;
  - a relay having a control input, the relay being connected between the direct current power supply and the input terminal for the direct current motor;
  - a switch connected between the direct current power supply and the control input for the relay;
  - and
  - a relay controller coupled to the control input for the relay, the relay controller periodically providing a control signal to the control input for momentarily closing the relay and energizing the direct current motor.
2. Apparatus as set forth in claim 1, the relay controller further comprising:
  - a high impedance power source connected by an output to the input terminal for the direct current motor;
  - means for sensing the voltage on the input terminal of the direct current motor and for indicating failure of the motor as a function in the voltage levels thereon.
3. Apparatus as set forth in claim 2, the relay controller further comprising:
  - a switching transistor having an output connected to the control terminal of the relay; and

microcontroller means having an output connected to apply a gate control signal to a gate of the switching transistor and a voltage level sensitive input coupled to the input terminal of the direct current motor and the output from the high impedance power source, the controller being responsive during periods when the relay is open to detection of a first elevated voltage level on the input terminal for indicating failure and being further responsive during periods when the relay is closed to a null voltage on the input terminal of the direct current motor for indicating failure.

4. Apparatus as set forth in claim 3, the microcontroller means further comprising:

a non-programmable controller having an output for providing the gate control signal and the voltage level detection input;

a programmable controller;

a network data link between the non-programmable controller and the programmable controller; and

the programmable controller being programmed to initiate periodic generation of the gate control signal by the non-programmable controller and to initiate periodic samples of the voltage level on the voltage level detection input.

5. Apparatus as set forth in claim 4, further comprising:

a controller area network including the network data link.

6. A condition monitoring and exercise apparatus for a direct current motor coupled by a relay to a power supply, the relay having a control input coupled by a hard switch to the power supply and an output

coupled to the direct current motor, the apparatus comprising:

a solid state switch having a gate and connected by an output to the relay control input;

a voltage divider network connected between the power supply and ground with an intermediate output coupled to a power output from the relay and the direct current motor;

an actuator connected to the gate for the solid state switch generating periodic, momentary gate actuation signals; and

a voltage level responsive fault indicator coupled to the intermediate output of the voltage divider network.

7. A condition monitoring and exercise apparatus as set forth in claim 6, further comprising:

controller means having a gate control output connected to the gate for the solid state switch; and a voltage level sensing input connected to the output for the voltage divider network.

8. A condition monitoring and exercise apparatus as set forth in claim 7, further comprising:

the controller means including programming to associate certain voltage levels detected on the output for the voltage divider network with a failure of the direct current motor, including, when the gate control signal is low, a first elevated voltage level, and when the gate control signal is high, a null voltage level.

9. A condition monitoring and exercise apparatus as set forth in claim 8, further comprising:

the controller means including a first controller having the gate control output and voltage sensing level input, a programmable controller for receiving the programming, and a controller area network incorporating the first controller and the programmable controller.

10. A condition monitoring and exercise apparatus as set forth in claim 9, further comprising:
  - a failure indicator;
  - a controller coupled to the failure indicator and to the programmable controller and responsive to a failure indication from the programmable controller for activating the failure indicator.
11. A motor vehicle comprising:
  - an engine;
  - a direct current electrical power system;
  - a first controller area network including a remote power module;
  - the remote power module including a three state input and a control signal output;
  - a direct current motor;
  - a motor control switch connected by one terminal to the direct current electrical power system;  
and
  - an energization relay for the direct current motor, the energization relay having an input terminal connected both to the control signal output of the remote power module and to a second terminal for the motor control switch and having a power output terminal connected to the direct current motor and to the three state input of the remote power module.

12. A motor vehicle as set forth in claim 11, further comprising:
  - a primary hydraulic pump driven by the engine;
  - an auxiliary hydraulic pump driven by the direct current motor; and
  - an hydraulic system powered by either the primary or the auxiliary hydraulic pump.
13. A motor vehicle as set forth in claim 12, the controller area network further comprising:
  - a body computer; and
  - a data link connecting the body computer and the controller for communication, the controller operating under the control of the body computer and the body computer being programmed to identify readings from the three state input with failure modes of the direct current motor.
14. A motor vehicle as set forth in claim 13, further comprising:
  - a gauge controller;
  - a warning light activated by the gauge controller; and
  - a second data link between the gauge controller and the body computer.
15. A motor vehicle as set forth in claim 14, wherein the body computer is programmed to associate certain voltage levels detected on the three state input with failure of the direct current motor, including, when the control signal is low, a first elevated voltage level, and when the control signal is high, a null voltage level.